

What is claimed is;

1. A process control system that controls processing executed on workpieces by, at least, one processing apparatus installed in each area in a factory, the processing results of which are predictable, comprising:

at least one measuring apparatus that is installed for the corresponding area and executes a measuring operation on workpieces processed in the area;

a transfer apparatus provided for the corresponding area to transfer the workpieces among apparatuses which include said processing apparatus and said measuring apparatus in the area; and

a control device installed for the corresponding area to control said processing apparatus, said measuring apparatus and said transfer apparatus in the area.

2. A process control system according to claim 1, wherein:

said control device sets a processing condition for said processing apparatus based upon the results of a measuring operation executed by said measuring apparatus on workpieces processed by said processing apparatus.

3. A process control system according to claim 2, wherein:

said control device engages said transfer apparatus to transfer the workpiece at least having undergone the processing executed by said processing apparatus to said measuring apparatus, compares a measurement value indicating the results of the processing executed on the workpiece, which is obtained through a measuring operation executed by said measuring apparatus on the workpiece at least having undergone the processing with a target value for the processing results and resets the processing condition for said processing

apparatus in correspondence to an error in the measurement value relative to the target value if the error is judged to be equal to or greater than a predetermined value.

4. A process control system according to claim 2, wherein:

said control device engages said transfer apparatus to transfer the workpiece at least having undergone the processing executed by said processing apparatus, to said measuring apparatus, compares a measurement value indicating the results of the processing executed on the workpiece, which is obtained through a measuring operation executed by said measuring apparatus on the workpiece at least having undergone the processing with a target value for the processing results, observes the state of a fluctuation in an error in the measurement value relative to the target value so as to predict the tendency of the fluctuation, and resets the processing condition for said processing apparatus in correspondence to the tendency of the fluctuation error before the error exceeds a predetermined value.

5. A process control system according to claim 3, wherein:

said measuring apparatus includes a means for self-diagnosis that executes a diagnosis to determine whether or not an abnormality has occurred in said measuring apparatus; and

said control device engages said means for self-diagnosis at said measuring apparatus to execute a self-diagnosis if the error in the measurement value indicating the processing results relative to the target value is judged to be equal to or greater than a predetermined value and resets the processing condition for said processing apparatus only if said measuring apparatus is determined to be error-free based upon the results of the self-diagnosis.

6. A process control system according to claim 1, wherein:
said control device ascertains a correlation between operation data and processing result data by executing a multivariate analysis based upon the operation data related to an operation of said processing apparatus and the processing result data indicating the results of the processing executed by said processing apparatus and obtains a predictive value that predicts the processing results based upon the correlation by using operation data obtained through processing executed on a workpiece other than the workpiece for which the correlation has been ascertained.
7. A process control system according to claim 6, wherein:
said control device engages said transfer apparatus to transfer the workpiece at least having undergone the processing executed by said processing apparatus to said measuring apparatus, compares a measurement value indicating the results of the processing executed on the workpiece obtained based upon the results of the measuring operation executed by said measuring apparatus on the workpiece at least having undergone the processing, which is obtained through a measuring operation executed by said measuring apparatus on the workpiece at least having undergone the processing, with the predictive value and regenerates the correlation if the error in the measurement value relative to the predictive value is judged to be equal to or greater than a predetermined value.
8. A process control system according to claim 6, wherein:
said measuring apparatus includes a means for self-diagnosis that executes a diagnosis to determine whether or not an abnormality has occurred in said measuring apparatus; and
said control device engages said means for self-diagnosis at said

measuring apparatus to execute a self-diagnosis if an error in the measurement value indicating the processing results relative to the predictive value is judged to be equal to or greater than a predetermined value and regenerates the correlation only if said measuring apparatus is determined to be error-free based upon the results of the self-diagnosis.

9. A process control system according to claim 6, wherein:
said multivariate analysis is executed by adopting a PLS method.

10. A method of process control executed by a control device in each area in a process control system having installed in each area at least one processing apparatus, the processing results of which are predictable, at least one measuring apparatus that executes a measuring operation on a workpiece processed by said processing apparatus, a transfer apparatus that transfers the workpiece among apparatuses which include said processing apparatus and said measuring apparatus and said control device that controls said processing apparatus, said measuring apparatus and said transfer apparatus, comprising:

a step in which said measuring apparatus executes the measuring operation on a workpiece processed by said processing apparatus; and

a step in which a processing condition is set for said processing apparatus based upon the results of the measuring operation executed by said measuring apparatus.

11. A method of process control according to claim 10, further comprising:

a step in which the workpiece at least having undergone the

processing executed by said processing apparatus is transferred to said measuring apparatus by said transfer apparatus, a measurement value indicating the results of the processing executed on the workpiece, which is obtained through a measuring operation executed by the measuring apparatus on the workpiece at least having undergone the processing is compared with a processing result target value and a processing condition for said processing apparatus is reset in correspondence to an error in the measurement value relative to the target value if the error is determined to be equal to or greater than a predetermined value.

12. A method of process control according to claim 10, wherein:
the workpiece at least having undergone the processing is transferred by said transfer apparatus to said measuring apparatus, a measurement value indicating the results of the processing executed on the workpiece, which is obtained through a measuring operation executed by said measuring apparatus on the workpiece at least having undergone the processing, is compared with a target value for the processing results, the state of a fluctuation of an error in the measurement value relative to the target value is observed to predict a tendency of the fluctuation, and the processing condition for said processing apparatus is reset in correspondence to the tendency of the fluctuation error before the error exceeds a predetermined value.

13. A method of process control according to claim 11, wherein:
in said step in which the processing condition for said processing apparatus is reset, said measuring apparatus is engaged in a self-diagnosis operation if the error in the measurement value indicating the processing results relative to the target value is determined to be equal to or greater than the predetermined value and

the processing condition for said processing apparatus is reset only if said measuring apparatus is judged to be error-free based upon the results of the self-diagnosis operation.

14. A method of process control according to claim 10, further comprising:

a step in which a correlation between operation data and processing result data is ascertained by executing a multivariate analysis based upon the operation data obtained from said processing apparatus and the processing result data indicating the results of the processing executed by said processing apparatus and a predictive value predicting the result is calculated based upon the correlation by using operation data obtained by processing a workpiece other than the workpiece for which the correlation has been ascertained.

15. A method of process control according to claim 14, wherein:

a workpiece at least having undergone the processing executed by said processing apparatus is transferred to said measuring apparatus by said transfer apparatus, a measurement value indicating the results of the processing executed on the workpiece obtained the a measuring operation executed by said measuring apparatus on the workpiece at least having undergone the processing is compared with the predictive value and the correlation is regenerated if an error in the measurement value relative to the predictive value is judged to be equal to or greater than a predetermined value.

16. A method of process control according to claim 15, wherein:

in said step in which the correlation is regenerated, said measuring apparatus is engaged in a self-diagnosis operation if the error in the measurement value indicating the processing results

relative to the predictive value is equal to or greater than the predetermined value and the correlation is regenerated only if said measuring apparatus is judged to be error-free based upon the results of the self-diagnosis operation.

17. A method of process control according to claim 14, wherein:
said multivariate analysis is executed by adopting a PLS method.

18. A process control system that controls processing executed on a workpiece by at least one processing apparatus installed in each area in a factory and having;

a processing chamber in which the processing is executed on the workpiece; a measuring unit that executes measurement processing on a workpiece before and after the processing is executed on the workpiece in said processing chamber, or either before or after the processing is executed on the workpiece in said processing chamber; and a means for in-apparatus transfer capable of transferring the workpiece at least between said processing chamber and said measuring unit, comprising:

at least one measuring apparatus installed in each area and capable of executing measurement processing on a workpiece undergoing the processing within the area;

a transfer apparatus installed in the corresponding area to transfer the workpiece among apparatuses within the area including said processing apparatus and said measuring apparatus; and

a control device installed in the area to control said processing apparatus, said measuring apparatus and said transfer apparatus installed in the area.

19. A process control system according to claim 18, wherein:

said measuring apparatus functions as a reference apparatus for said measuring unit of said processing apparatus and checks on a regular basis whether or not there is any deviation of measurement results obtained by said measuring unit relative to measurement results obtained by said measuring apparatus or whether or not such a deviation is within an allowable range.

20. A process control system according to claim 18, wherein:
 - said measuring apparatus is utilized to prepare measurement processing information required by said measuring unit of said processing apparatus to execute the measurement processing; and
 - said measuring unit executes the measurement processing based upon said measurement processing information.
21. A process control system according to claim 20, wherein:
 - said measurement processing information includes, at least, coordinate information used to set coordinates specifying a measurement point on the workpiece.
22. A process control system according to claim 18, wherein:
 - an object of measurement executed by said measuring apparatus and said measuring unit of said processing apparatus is the film thickness of a film formed on the workpiece.
23. A process control system according to claim 18, wherein:
 - an object of measurement executed by said measuring apparatus and said measuring unit of said processing apparatus is a deposit present on the workpiece.
24. A process control system according to claim 18, wherein:

an object of measurement executed by said measuring apparatus and said measuring unit of said processing apparatus is the width of a pattern formed on the workpiece.

25. A process control system according to claim 18, wherein:

an object of measurement executed by said measuring apparatus and said measuring unit of said processing apparatus is defects present on the workpiece.

26. A process control system according to claim 18, wherein:

an object of measurement executed by said measuring apparatus and said measuring unit of said processing apparatus is an overlay of patterns formed on the workpiece.

27. A method of process control executed by a control device installed in each area in a process control system having installed in each area at least one processing apparatus, at least one measuring unit provided at said processing apparatus, at least one measuring apparatus capable of executing measurement processing on workpieces undergoing processing executed by said processing apparatus, a transfer apparatus that transfers the workpieces among apparatuses including said processing apparatus and said measuring apparatus and said control device that controls said processing apparatus, said measuring apparatus and said transfer apparatus, comprising:

a step in which a workpiece processed by said processing apparatus undergoes measurement processing executed by said measuring unit;

a step in which a processing condition is set for said processing apparatus based upon the results of the measurement processing

executed by said measuring unit; and

a step in which a workpiece is transferred to said measuring apparatus by said transfer apparatus, undergoes the measurement processing executed by said measuring apparatus and the processing condition for said processing apparatus is set based upon the results of the measurement processing while said measuring unit undergoes maintenance work.

28. A method of process control according to claim 27, wherein:

said measuring apparatus functions as a reference apparatus for said measuring unit of said processing apparatus and checks on a regular basis whether or not there is any deviation of measurement results obtained by said measuring unit relative to measurement results obtained by said measuring apparatus or whether or not such a deviation is within an allowable range.

29. A method of process control according to claim 27, wherein:

said measuring apparatus is utilized to prepare measurement processing information required by said measuring unit of said processing apparatus to execute the measurement processing; and

said measuring unit executes the measurement processing based upon said measurement processing information.

30. A method of process control according to claim 27, wherein:

said measurement processing information includes, at least, coordinate information used to set coordinates specifying a measurement point on the workpiece.

31. A method of process control according to claim 27, wherein:

an object of measurement executed by said measuring apparatus

and said measuring unit of said processing apparatus is the film thickness of a film formed on the workpiece.

32. A method of process control according to claim 27, wherein:
an object of measurement executed by said measuring apparatus
and said measuring unit of said processing apparatus is a deposit
present on the workpiece.

33. A method of process control according to claim 27, wherein:
an object of measurement executed by said measuring apparatus
and said measuring unit of said processing apparatus is the width of a
pattern formed on the workpiece.

34. A method of process control according to claim 27, wherein:
an object of measurement executed by said measuring apparatus
and said measuring unit of said processing apparatus is defects
present on the workpiece.

35. A method of process control according to claim 27, wherein:
an object of measurement executed by said measuring apparatus
and said measuring unit of said processing apparatus is an overly of
patterns formed on the workpiece.

36. A process control system that controls two different types of
processing apparatuses installed in each area in a factory, comprising:
at least one measuring apparatus installed in each area and
capable of executing a measuring operation on workpieces undergoing
the processing within the area;
a transfer apparatus installed in the corresponding area to
transfer the workpieces among apparatuses within the area including

said processing apparatuses and said measuring apparatus; and
a control device installed in the corresponding area to control
said processing apparatuses, said measuring apparatus and said
transfer apparatus in the area.

37. A process control system that controls processing executed on
workpieces by at least one processing apparatus installed in each area
in a factory and having a processing chamber in which the processing
is executed on the workpieces; a measuring unit that executes
measurement processing on a workpiece before and after the
processing is executed on the workpiece in said processing chamber, or
either before or after the processing is executed on the workpiece in
said processing chamber; and a means for in-apparatus transfer
capable of transferring the workpiece at least between said processing
chamber and said measuring unit, comprising:

at least one measuring apparatus installed in each area and
capable of executing measurement processing on workpieces
undergoing the processing within the area;

a transfer apparatus installed in the corresponding area to
transfer the workpieces among apparatuses within the area including
said processing apparatus and said measuring apparatus; and

a control device installed in the corresponding area to control
said processing apparatus, said measuring apparatus and said
transfer apparatus in the area, wherein:

said control device implements control on said processing
apparatus, said measuring apparatus and said transfer apparatus so
as to engage the measuring unit of another processing apparatus to
execute the measuring processing on a workpiece undergoing the
processing executed by a given processing apparatus if the measuring
unit of the given processing apparatus is not available for use.